

PH
NL031388

DOSSIER

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 May 2001 (17.05.2001)

PCT

(10) International Publication Number
WO 01/35403 A1

(51) International Patent Classification⁷: **G11B 20/00**,
23/28

(21) International Application Number: PCT/NL00/00710

(22) International Filing Date: 3 October 2000 (03.10.2000)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
1013562 11 November 1999 (11.11.1999) NL

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AT
(utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility
model), DK, DK (utility model), DM, DZ, EE, EE (utility
model), ES, FI, FI (utility model), GB, GD, GE, GH, GM,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,
MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK
(utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ,
VN, YU, ZA, ZW.

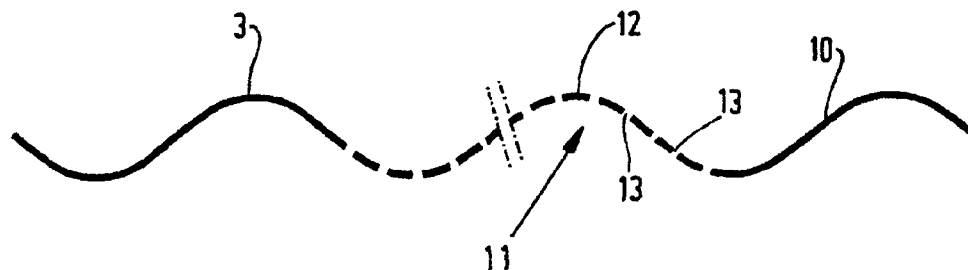
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WRITABLE OPTICAL REGISTRATION CARRIER AND METHOD FOR MANUFACTURING A MASTER MOULD FOR SUCH A WRITABLE REGISTRATION CARRIER



(57) Abstract: A writable optical registration carrier including at least one writable track (3), onto which a programme can be written, which programme comprises information stored in the form of variation in a physical parameter, wherein the track includes verification effects (13) that have been provided thereon at verification positions (12). The verification effects generate reading errors, which are preferably non-correctable.

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Writable optical registration carrier and method for manufacturing a master mould for such a writable registration carrier.

5 The invention relates to a writable optical registration carrier including at least one writable track, onto which a programme can be written, which programme comprises information stored in the form of variation in a physical parameter.

10 The invention furthermore relates to a method for manufacturing a master mould for such a writable optical registration carrier.

15 It is known to use a so-called master mould for duplicating optical registration carriers, such as CD-ROM's, by means of which master mould said CD-ROM's are manufactured either directly or by means of auxiliary moulds produced with said master mould, is known in the industry. One advantage of such a manufacturing method is that relatively large numbers of CD-ROM's can be produced in a relatively inexpensive manner.

20 As disclosed in the applicant's patent WO 99/17288, it is furthermore possible by means of the master mould to provide the CD-ROM to be subsequently produced by means of said master mould with verification effects stored in verification positions thereon. The programme stored on the CD-ROM and/or the playback equipment for the CD-ROM and/or separately supplied software include means for verifying whether the expected verification effects are indeed present at the previously
25 known verification positions. In this way it is possible to distinguish original CD-ROM's from copied CD-ROM's. On the copied CD-ROM's, which have for example been produced by means of another master mould, no verification effects will be present at the positions corresponding to the verification positions. Also in those cases where the original CD-ROM thus produced is copied directly onto a writable optical registration
30 carrier, such as a CD-R (recordable), said verification effects will not be present on the copied CD-R.

35 A method of this kind is quite suitable for producing CD-ROM's by means of a master mould. When the method disclosed in WO 99/17288 is used, it is still possible to copy optical registration carriers, but it will be relatively easy to recognize whether an optical registration carrier is an original or a copy.

At present writable optical registration carriers, such as CD-R's, are also used for producing relatively small series of registration carriers. When a producer produces CD-R's and subsequently distributes them, it is relatively easy for a user of such a CD-R to make further copies which are impossible to distinguish from the original CD-R's.

The object of the invention is to provide a writable optical registration carrier that can be distinguished from copies and/or that cannot be copied.

This objective is accomplished with the writable optical registration carrier according to the invention in that the track includes verification effects that have been provided thereon at verification positions.

The producer of a CD-ROM, for example, records a desired programme onto a number of identical writable optical registration carriers (for example CD-R's). The verification positions associated with the specific series of CD-R's and the verification effects that are present at the verification positions are stored in this programme or in a separately supplied programme. It is possible to recognize the CD-ROM as an original specimen on the basis of the verification effects that are present at the verification positions. In addition it is possible to arrange for the programme to function only if the expected verification effects are indeed present at the verification positions.

The verification effect is preferably such that the desired programme can be recorded onto the track by means of the available writing equipment, whilst the verification effects will either be considered as illegible or as detectable by the available reading equipment. When a user attempts to copy such an optical registration carrier according to the invention to a writable optical registration carrier that is known per se, a deviant, for example illegible, signal will be detected at the verification positions by the reading equipment. When the information from the written optical registration carrier according to the invention is subsequently written onto the known optical registration carrier, it will not be possible to record any information at the verification positions, therefore. If random information is recorded at the verification positions after all, it will be possible to read this information again by means of the reading apparatus to be subsequently

used, unlike the verification effects of the original optical registration carrier.

Accordingly, the verification effects must preferably be arranged in a way that makes it impossible to produce a copy of an optical registration carrier that includes verification effects identical to those that are present on said optical registration carrier by means of the standard reading and writing apparatus that is available on the market.

Different verification effects adapted to the registration carrier in question are possible for the various writable optical registration carriers, such as CD-R (CD-recordable), CD-RW (CD-rewritable), DVD-R (DVD-recordable), DVD-RW (DVD-rewritable) and other DVD formats, such as DVD+RW, DVD-RAM.

Another advantage of the writable optical registration carrier according to the invention is that a producer himself can record the desired software onto a selected number of registration carriers. The producer does not need to turn to a manufacturer of master moulds for that purpose.

It is noted that EP-A2-0 936 610 discloses a registration carrier wherein verification effects can be recorded onto the registration carrier together with the programme. A registration carrier of that kind is not capable of being written on, however. Furthermore it is noted that WO 99/11064 discloses an optical registration carrier which is likewise provided with verification effects, which have been recorded thereon simultaneously with the programme. The optical registration carrier according to the invention, on the contrary, is a writable registration carrier, onto which verification effects are provided at verification positions in advance and a desired programme is only recorded thereon at a later stage by the user.

One embodiment of a writable optical registration carrier according to the invention is characterized in that the writable track includes a track following arrangement, which is suitable for addressing positions along the track, whilst the writable track is provided, at least near one of said verification positions, with a second variation of a physical parameter, which constitutes at least one of said verification effects.

A track following arrangement formed in the track, for example a wavelike pattern, is suitable for addressing the position along

the track. The second physical parameter can be an interruption in said wavelike pattern or a modulation that has been generated in said track.

The invention will now be explained in more detail by means of the drawing, wherein:

5 Figure 1 is a schematic view of a device suitable for carrying out a method according to the invention;

 Figure 2 is a schematic representation of a part of a writable optical registration carrier according to the invention.

10 The example shown in Figures 1 and 2 concerns a writable optical registration carrier in the form of a CD-R (CD-recordable). It will be apparent that the optical registration carrier may also be another writable and rewritable optical registration carrier that is known per se.

15 Figure 1 shows a device 1 that is suitable for carrying out the method according to the invention. Device 1 includes a module 2 for generating a desired, known CD-R wavelike pattern 3 in a track. Device 1 furthermore includes a second module 4 for generating a modulation signal 5 for providing verification effects at desired verification positions in the track. Module 4 is controlled by module 2 for providing the modulation 5 generated by module 4 at the desired, predetermined verification positions that have been generated or transmitted by module 2. The signals from modules 2 and 4 are fed to a laser beam recorder 9 via lines 7, 8. Then a desired spiral-shaped track is formed in a master mould by means of laser beam recorder 9. Subsequently, discs of plastic material are produced either directly, by means of the master mould, or by means of auxiliary moulds to be derived from the master mould, which discs are provided with a mirror image of the track that is present on the master mould or with a copy thereof. Following that, the coatings required for a CD-R are applied to the plastic discs.

25 Figure 2 shows the track 10 that is present in the master mould and, subsequently, in the CD-R. Track 10 comprises the wave pattern 3 generated by module 3. In addition, track 10 comprises at predetermined verification positions 11 a modulated track portion 12 that includes interruptions 13 resulting from the modulated signal 5.

30 The operation of the writable optical registration carrier according to the invention will now be explained in more detail below.

A manufacturer produces CD-R's according to the invention in the above-described manner.

5 A producer who wishes to record a programme onto a CD-R according to the invention in order to produce a CD-ROM writes the programme data onto track 10 by means of known writing apparatus. The producer has the information with regard to the verification positions and the verification effects of the specific CD-R that are present thereon. Consequently, no relevant data will be recorded at the verification positions. The writing apparatus that is currently available is relatively
10 robust, so that the interruptions 13 in track portion 12 will not interfere with the writing apparatus following track 10. Also the verification positions and the verification effects present thereon are stored in the programme to be recorded onto the registration carrier.

When the thus obtained registration carrier (CD-ROM)
15 is used, the programme present thereon will control the reading apparatus to verify whether the verification effects are indeed present at the verification positions. If this is the case, further activation of the programme can take place.

If a user wishes to copy this CD-ROM, the interruptions
20 13 present in track portion 12 will be detected by the reading apparatus upon reading the required information that is present on track portion 12 of the CD-ROM. The effect of the interruptions 13 and the information in track portion 12 is preferably such that the data being read will be considered illegible and non-correctible.

25 The conventional writing apparatus, however, is only capable of writing readable information, whether relevant or not. It is not possible, therefore, to write information that is illegible, like the information that is present on track portion 12.

In one example of producing a CD-R according to the
30 invention, a modulation pattern 5 comprising pulses having a 50% duty cycle and a period of 2 μ seconds was used. The effective length upon play-back of the entire track portion 12 was about 1.6 m seconds (800 period) to about 3.2 m seconds (1600 period). The signal was written onto track 10 with I3-I11 pulses by means of a standard writing apparatus. Upon reading
35 of track portion 12 by means of standard reading apparatus, the correction module that is present in the standard reading apparatus attempted to correct the information present in track portion 12 at C1-C2 level, which are correction methods for CD audio as well as for CD-ROM correction

errors. The format and the duration of the error present in track portion 12 appeared to be such, however, that the reading apparatus considered said track portion 12 incorrigible. Attempts to copy the CD-R thus produced by means of known reading and writing equipment cannot result in an identical copy of the track portion 12, therefore. At present it is not possible, using the current writing apparatus, to write information that the conventional reading apparatus will not be able to read at a later stage. It is possible, however, to have the writing apparatus write information that can be read by the reading apparatus and that will subsequently be considered to be irrelevant or that cannot be further processed by the reading apparatus.

The verification effects on track portion 12 disturbed and destroyed the C1 and the C2 parity as well as the user data and the subcode in the track portion 12 in question. These effects cannot be generated with the standard writing apparatus that is currently available.

The verification effects to be recorded onto the track portions 12 and the lengths of said track portions 12 must be determined individually for each type of writable optical registration carrier.

Thus the PO-parity and the PI-parity in track portion 12 will have to be destroyed for DVD, for example.

The length of the track portion 12 that includes track modulation with pulses was 1.6- 3.2 m seconds. This length is greater than the length that is currently considered to be corrigible and thus allowable for a properly functioning CD.

The differences between a conventional CD-R and a CD-R according to the invention are also optically discernable.

It is preferred to provide the verification effects outside the control portions, such as lead-in, lead-out, etc.

Instead of providing the track with a wavelike pattern for the purpose of addressing a position along the track, it is also possible to provide other known track following systems.

It is also possible to provide the verification positions and the verification effects present thereon separately, for example on a floppy disc.

CLAIMS

1. A writable optical registration carrier including at least one writable track, onto which a programme can be written, which programme comprises information stored in the form of variation in a physical parameter, characterized in that said track includes verification effects that have been provided thereon at verification positions.
2. A writable optical registration carrier according to claim 1, characterized in that the writable track includes a track following arrangement, which is suitable for addressing positions along the track, whilst the writable track is provided, at least near one of said verification positions, with a second variation of a physical parameter, which constitutes at least one of said verification effects.
3. A writable optical registration carrier according to claim 2, characterized in that the second variation of a physical parameter has a modulation that substantially corresponds to a modulation of the programme that can be recorded in the track.
4. A writable optical registration carrier according to any one of the preceding claims, characterized in that at least one track portion provided with verification effects has a length which is greater than a predetermined, for the registration carrier in question, corrigible length of an error present in the track.
5. A writable optical registration carrier according to any one of the preceding claims, characterized in that said verification effects generate incorrigible reading errors during operation.
6. A method for manufacturing, by means of a master mould, a writable optical registration carrier according to any one of the preceding claims, which registration carrier includes at least one writable track, onto which a programme can be written, which programme comprises information stored in the form of variation in a physical parameter, characterized in that random verification positions are generated on the track, after which verification effects are provided at the verification positions on the master mould.
7. A method according to claim 5, characterized in that a track following arrangement is generated by means of a first apparatus in a track to be formed on said mould, whilst a second variation of a physical parameter is generated by means of a second apparatus, after which said track is formed on said master mould by means of a laser beam, which

track comprises both the track following arrangement and second variations of physical parameters, wherein said second variation is provided near one of said verification positions, forming at least one of said verification effects.

5 8. A method according to claim 6, characterized in that said second variation of a physical parameter has a modulation that substantially corresponds to the modulation of the programme that can be recorded onto the optical registration carrier.

10 9. A method according to any one of the claims 6 - 8, characterized in that said verification effects are provided at least along a track portion having a length greater than a predetermined, for the registration carrier in question, allowable length of an error present in the track.

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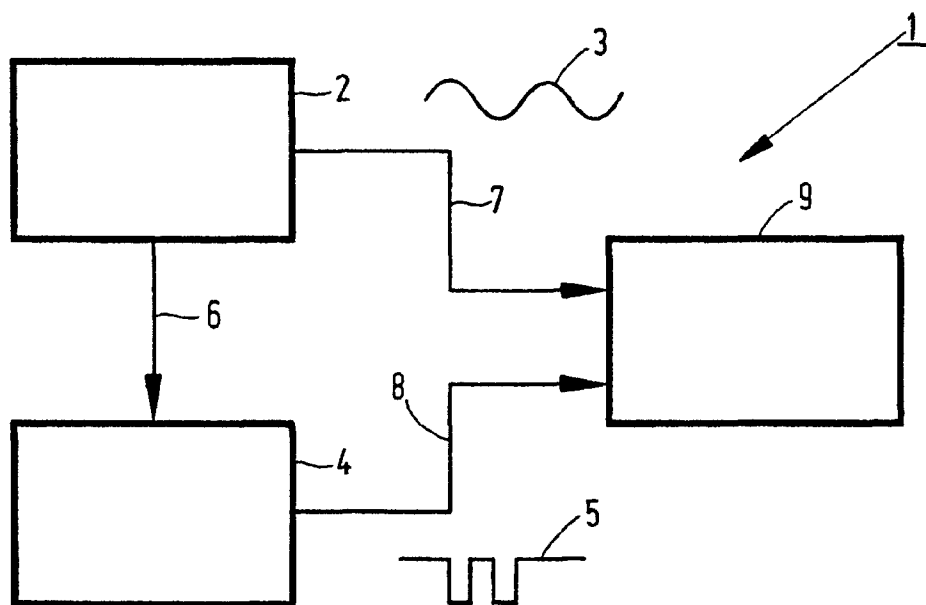


FIG.1

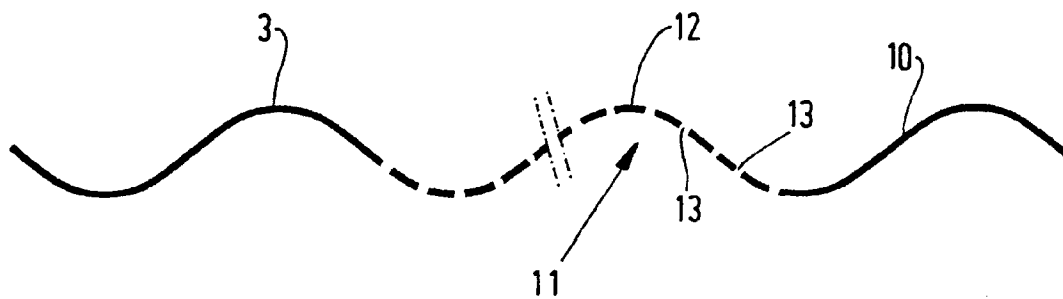


FIG.2

INTERNATIONAL SEARCH REPORT

national Application No

PCT/NL 00/00710

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G11B20/00 G11B23/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	WO 99 11064 A (KONINKL PHILIPS ELECTRONICS NV ;PHILIPS AB (SE)) 4 March 1999 (1999-03-04) page 1, line 1 -page 2, line 14 page 7, line 3 -page 8, line 10	1
A	WO 99 17288 A (WIJN JOSEPHUS MARINUS ;OD & ME BV (NL); STAPPEN ARNOLDUS JOHANNES) 8 April 1999 (1999-04-08) cited in the application the whole document	1-9
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

13 February 2001

Date of mailing of the international search report

21 02. 2001

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

national Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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